

WHAT IS CLAIMED IS

1. An integrated start-up circuit comprising:

a start-up capacitor, for providing a supply voltage for powering a control-circuit of the power supply, wherein said start-up capacitor is coupled to a supply voltage terminal of said control-circuit;

a first bleeding resistor, connected from a first AC input of a bridge rectifier to said start-up capacitor;

a second bleeding resistor, connected from a second AC input of said bridge rectifier to said start-up capacitor; and

an ON/OFF circuit, for controlling PWM operation, wherein said ON/OFF circuit will enable PWM operation whenever said supply voltage of said start-up capacitor exceeds a start-threshold voltage, and wherein said ON/OFF circuit will disable PWM operation after the supply voltage drops below a stop-threshold voltage.

2. The integrated start-up circuit as claimed in claim 1, wherein said first bleeding resistor and said second bleeding resistor discharge an EMI filter of the power supply whenever an AC input source of the power supply is turned off, wherein said AC input source will charge up said start-up capacitor whenever said AC input source is turned on, and wherein said AC input source will charge up said start-up capacitor via said first bleeding resistor, said second bleeding resistor, and said bridge rectifier.

3. The integrated start-up circuit as claimed in claim 1 further comprising:

a latch circuit, connected in parallel with said start-up capacitor, wherein the power supply will be locked up in an off-state whenever said latch circuit is enabled by a protection circuit;

a line-voltage detector, for detecting the line voltage of the power supply and providing over-power protection to the power supply during PWM operation;

an auxiliary transformer winding of the power supply, having a first terminal and a second terminal;

an auxiliary capacitor, connected to said first terminal of said auxiliary transformer winding;

a first diode, having an anode terminal and a cathode terminal, wherein said cathode terminal of said first diode is connected to said second terminal of said auxiliary transformer winding, and wherein said anode terminal of said first diode is connected to the ground reference; and

a second diode, having an anode terminal and a cathode terminal, wherein said anode terminal of said second diode is connected to said auxiliary capacitor, and wherein said cathode terminal of said second diode is connected to said start-up capacitor.

4. The integrated start-up circuit as claimed in claim 1 further comprising:

a detection capacitor, for providing a bias voltage;

a resistor, connected from said cathode of said first diode to said detection capacitor;

a detection resistor, for converting said bias voltage to a bias current;

a first-mirror transistor, for producing a first-mirror current from said bias current; and

a second-mirror transistor, for providing a second-mirror current to said line-voltage detector, wherein a source of said first-mirror transistor and a source of said second-mirror transistor are tied together and are connected to said detection capacitor

via said detection resistor, wherein a gate of said first-mirror transistor, a gate of said second-mirror transistor, and a drain of said first-mirror transistor are tied together, wherein said drain of said first-mirror transistor is connected to said start-up capacitor, and wherein a drain of said second-mirror transistor supplies said second-mirror current to said line-voltage detector.

5. The integrated start-up circuit as claimed in claim 1, wherein the ON/OFF circuit further comprises:

a first resistor, a second resistor, and a third resistor;

a first zener diode and a second zener diode connected in series with said first resistor, said second resistor, and said third resistor, wherein said first zener diode is connected to the supply voltage terminal and said third resistor is connected to the ground reference;

a first n-transistor, wherein a gate of said first n-transistor is connected to a junction of said first resistor and said second resistor, and wherein a source of said first n-transistor is connected to the ground reference; and

a first p-transistor, wherein a drain of said first n-transistor is connected to a gate of said first p-transistor, and wherein a source and a drain of said first p-transistor are connected in parallel with said first zener diode.

6. The integrated start-up circuit as claimed in claim 5, wherein the ON/OFF circuit further comprises:

a fourth resistor connected from said gate of said first p-transistor to the supply voltage terminal;

a second p-transistor, wherein a source of said second p-transistor is connected to the supply voltage terminal, and wherein a drain of said second p-transistor produces a power voltage;

a first inverter and a second inverter, wherein said drain of said first n-transistor is further connected to an input of said first inverter, wherein an output of said first inverter is connected to an input of said second inverter, wherein an output of said second inverter drives a gate of said second p-transistor, and wherein PWM operation starts after said second p-transistor is turned on; and

a second n-transistor, wherein said output of said second inverter drives a gate of said second n-transistor, wherein a drain of said second n-transistor is connected to a junction of said second resistor and said third resistor, and wherein a source of said second n-transistor is connected to the ground reference.